

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington DC 20554**

| | | |
|---|---|-----------------|
| In the matter of: |) | |
| |) | |
| Amendment of Part 97 of the |) | RM-11306 |
| Commission's Rules Governing the |) | |
| Amateur Radio Service |) | |

Comments Regarding the Petition to Allocate Frequencies in the Amateur Radio Service by Bandwidth Filed by the American Radio Relay League on 14 November 2005.

My name is James G. Gorman, Amateur Radio callsign WA0LYK, and I am a licensed amateur radio operator and a member of the American Radio Relay League. I have been active in amateur radio since 1964. I graduated from the University of Kansas in 1972 with a BSEE.

INTRODUCTION

The petitioners would have the FCC completely change the current regulatory paradigm for High Frequency (HF) bands used in the Amateur Radio Service. The following discussion predominately deals with the Amateur bands between 1.8 MHz and 30 MHz. There are some issues with the higher bands also and I have mentioned these at the end.

The ARRL's contains numerous incomplete and unsubstantiated claims that certain conditions now require a massive change at this time in order to provide an enhanced environment for digital mode experimentation. The ARRL has not provided a single piece of objective data such as spectrum usage studies, spectrum efficiency studies, technical efficiency studies, or economic efficiency studies to support their claims.

The ARRL has stated the following in their petition:

“(b) We are in the early stages of a dramatic shift in Amateur operating patterns, especially in the High Frequency (HF) bands. It is impossible to determine now where this shift may lead. The Commission’s Rules should not stand in the way of where technology takes Amateur Radio in its fulfillment of the bases and purposes of the Amateur Radio Service (47 C.F.R. 997.1).”

By their own admission, they have not performed the necessary engineering studies to determine what shift there is, nor where it may lead! Yet the ARRL have proposed that a massive change be made in order to accommodate a phantom idea.

I will briefly address some of the unsupported claims in this proposal. In the end however, I cannot support this petition and urge the FCC to reject it entirely. The FCC should also direct the ARRL that future petitions should contain supporting studies and data for any recommendations and/or statements of fact.

EMISSION TYPES LIMITING EXPERIMENTATION

The ARRL petition states the following:

“The Amateur Radio Service rules limit emission types that can be deployed in the Amateur Service. The reason for this is largely historical, rather than practical. In this Petition, ARRL suggests a shift in regulatory philosophy, which is the Amateur Radio version of a change from a “command and control” model for Amateur Radio regulation to one based on facilitating research, development, experimentation and refinement of Amateur Radio digital communications techniques and advanced technologies. ¹ In order to encourage the implementation of new technologies in the Amateur Radio Service, the rules must be modified to more flexibly accommodate use of such technologies. ² The philosophy espoused herein is to regulate bands by maximum bandwidth rather than specific or defined emission modes. This is to make it easier for new types of emissions to be introduced compatibly among incumbent emission types, while reducing or eliminating the regulatory burden of interpreting or applying rules to new technologies in the context of a presently cumbersome regulatory matrix.”

This statement proposes that the current regulatory paradigm makes research, development, or experimentation into digital techniques difficult and that bandwidth limits will result in easier and more experimentation of digital techniques and technologies. It is appropriate for the ARRL, in a regulatory proceeding, to provide substantiation by stating concrete examples where emission types have been an impediment thereby proving their assertion, yet there is not even one. The petition does not even define what is meant by “new technology”. It leads one to assume there is an entirely new development, not even used by commercial providers, waiting in the wings. Apparently, the ARRL expects this assertion to be taken on faith alone!

Probably 95+ percent of digital communications today on HF use modems that are connected to the audio chain of a SSB transceiver. The predominate method is to use either a dedicated modem or a computer sound card connected to the microphone or audio “line” input of a transceiver operated in SSB mode. As a result, almost all digital protocols in use today use either J2D, J2E, J3D, or J3E type emissions. Not one manufacturer of Amateur Radio transceivers offer an HF model that has a new emission type mode that is not currently in use. Consequently, “emission type” regulations alone can not be shown to have had an adverse effect on the ability of one to experiment with digital modes on the HF Amateur bands.

This concept of emission types stifling experimentation as presented by the ARRL, is the underlying basis for **all** of the changes requested in the petition. Since it is so glaring in its technical deficiency, with totally undocumented, unsubstantiated assertions, the FCC should reject the petition completely.

BANDWIDTH REGULATION EFFECTS ON EXPERIMENTATION

The ARRL petition does not discuss the negative side effects of bandwidth limitations on digital experimentation. I will attempt to provide a short discussion of some of the stifling effects that bandwidth limitations may provide. A recent protocol called Olivia has become quite prevalent on the HF Amateur bands. This protocol contains the ability to use several bandwidths and numbers of different tones. It is a perfect stepping stone to an adaptive bandwidth protocol. The adaptive algorithms could be used to not only insure accurate transmissions based upon propagation vagaries but could also be used to reduce bandwidth based upon spectrum usage. In other words, if adjacent signals appear, the bandwidth could be automatically narrowed and thereby use spectrum more efficiently. However, with bandwidth limitations, one would have to always use the “wide” segment to insure the limits were not exceeded. This would reduce the incentive to experiment with this type of protocol.

Another area open for experimentation is the use of what I call “out of band signaling”. Currently, the most accurate digital modes are the “TOR” modes, i.e. AMTOR, PACTOR, etc. These modes are session oriented and do not share frequencies well. Consequently, there is a large incentive for services such as Winlink 2000 to spread out their control stations horizontally in frequency. In other words, each control station has its own assigned frequency. Somewhat wider bandwidths such as 4 to 5 kHz should allow one to use part of the bandwidth for data and part of the bandwidth for control signaling. One station could be transmitting data to a control station while other stations are registering, leaving, etc. with the control station, allowing for a much higher usage on fewer frequencies.

The need for this type of experimentation was recognized at the September, 2005 IARU Region 1 Plenary meeting when resolution DV05_C4_Rec_11 was accepted. The resolution, that was Proposed by RAAG, seconded by RSGB, approved unanimously, states:

IARU Member Societies should encourage the development of improved openly specified modulation techniques, including corresponding modem hardware, which can be combined or integrated into channel-sharing digital network protocols.

Experimentation such as I have described above will be restricted by the bandwidth limitations as specified in this petition. However, under current regulations, it is simple and easy to do. These are not unique ideas. They have been gleaned from my experience in the telecom industry and from the

recent FCC proceedings on Software Defined Radios.

The ARRL petition is glaring in its lack of discussion of these issues and how bandwidth regulation will affect them. There can be no doubt that the new regulations as proposed by the ARRL will impose their own set of restrictions on experimentation. The FCC can not make an informed decision with the incomplete and inaccurate information provided in this petition concerning these factors. This petition is woefully inadequate in this area and the FCC should reject it for lack of adequate preparation.

MULTIMEDIA DEVELOPMENTS

The ARRL petition states:

“This “rules rewrite,” as it came to be called, incorporated the concept of using words and abbreviations to designate a group of emissions, such as the variations of “phone.” The rules incorporated bandwidth and symbol-rate limits. This double-regulation (limitation to specified emissions with specific bandwidth maxima, and limitation of those emissions to specific symbol rate limits) has undoubtedly handicapped Amateur digital data communication development and use. It is now necessary to permit higher data rates, in order to permit the development of digital multimedia technology, which is now coming into use in the Amateur Radio Service, and which has great promise for improving and fostering more effective emergency and disaster relief communications.”

The concept of using words and abbreviations to designate a group of emissions is commonly known as “content” regulation. The ARRL petition, by confusing the meaning of content, emission types, and symbol rate limitations, attempts to show that all of these together have handicapped Amateur digital data communication development. They provide no substantiation for any of the claims made. For this reason alone, this petition should be dismissed and a more accurate petition be required.

Multimedia technology is primarily restricted by content regulations, not by emission type or symbol rate limits. Current content restrictions disallow sending both a phone transmission and a data transmission on the same frequency. The ARRL proposes a massive change to current regulation simply because there is a problem with content restrictions. They do not provide any discussion of simpler means to accomplish “multimedia” nor do they discuss how other IARU Regions have handled the issue.

IARU Region 1 has defined digital voice signals as “digimode” and is only allowed in the data portions of their Amateur bands. This allows the combination of digital voice and digital data multimedia to be used on the same frequency. It is a compromise solution, since analog phone can not send a 'multimedia' data transmission in the phone portion. They can however, still send image transmissions. The ARRL should have discussed this option. The ARRL proposal will place “multimedia' in different

segments of the Amateur bands from Region 1 and complicate international contacts using this new content type. For international contacts to occur, twice the spectrum will be required, one frequency by a station in Region 1 and another used by a US station. This is not conducive to efficient spectrum use and the FCC should require a more detailed discussion of why it is necessary.

HIGHER DATA RATES REQUIRED

The ARRL makes the claim:

“10. The real catalyst for change, however, is the need to permit higher speed data in the Amateur bands from 1.8 MHz to 450 MHz, above which there are no limits except to contain the transmitted signal within the allocation edges. A recent example of the concern was an inquiry received by ARRL from a technical experimenter, Mr. Steve Waterman, licensee of Amateur Station K4CJX, concerning the symbol rate restrictions of HF amateur communications:

. . . [About the potential to test a new mode with a symbol rate of nearly 5600 baud and a bandwidth of 2.4 kHz. The amateur rules currently restrict symbol rates to 1200 baud on 10 meters and 300 baud on all other HF bands. [A m staff] suggested that an experimental license might be a possibility.”

The ARRL petition is technically deficient in discussing the effects of higher data rates on spectrum use. Granted, the necessary bandwidth limits will provide a limit on data rates, both symbol and bits per second, however it doesn't absolve the ARRL from providing a detailed technical analysis of what they are attempting to accomplish by their changes. The ARRL petition inappropriately mixes the terms symbol rate and data rate. Data rate normally describes the bits per second achieved on a data channel, not the baseband symbol rate. Increasing the data bit rate is achievable with the current symbol rate limits, albeit at an increased Signal to Noise factor. However, substantial increases in the symbol rate has a direct bearing on the necessary bandwidth of a signal. Their example makes one wonder about the mathematics, such as Nyquist's law, used to show that one can provide a 5600 baud baseband signal in 2.4 kHz bandwidth. One can only assume that perhaps they should have used bit rate rather than baud. However one is left to wonder because no mathematical analysis is provided.

The ARRL petition does not have ONE mathematical analysis using commonly accepted laws such as Nyquist or Shannon's to support their analysis. Without these the FCC (or anyone else) cannot adequately assess the claims made nor the solutions proposed by the ARRL. In fact, one has to wonder how the proposed necessary bandwidth restrictions were arrived at with no mathematical foundation as background. The FCC should reject the proposal and require a more technical assessment be provided by the ARRL in any future petition.

VOLUNTARY BANDPLAN

The ARRL proposal recommends higher data speeds be allowed and to:

“do so in a manner that does not create interference with current analog or other digital modes in regular use in these crowded allocations.”

They indicate that other IARU members do not regulate bands at all but simply use a band plan to control sub-segments where certain transmissions are recommended. However, they then admit that:

“complete reliance on informal band planning does not appear to be a suitable option in the United States.”.

These statements are conflicting and the ARRL does not make any recommendations as to how band planning for the sub-segments of their proposed sub-bands be done. This is a total abdication of responsibility when proposing such a massive regulatory rewrite. Under this proposal there will be no universally acceptable band plan available for where digital and analog stations should operate in any of the three sub-segments. This is a prescription for chaos and violates the ARRL's statement that interference with current analog or other digital modes should be minimized.

The ARRL also recognizes that there are incompatible emissions types in their discussion of automatic stations. They state that:

“... environment where such (automatic) stations might initiate transmissions that would interfere with ongoing communications on the same frequency using incompatible emission types.”

The ARRL petition makes no attempt to reconcile these conflicting points of view of what interference might occur. Worse still is the decision to recommend placing digital signals with low crest factors (high average power) and analog signals with high crest factors (low average power) together in sub-bands with the apparent hope that chaos will not reign. This is a perfect formula for the FCC to end up with a much increased enforcement load of interference complaints.

The ARRL proposal should be rejected and the ARRL should be directed that any refiling must include detailed procedures for creating an acceptable band plan. The band plan must recognize interference potentials between digital signals with a very high average power and analog signals with very low average power such as analog SSB. In addition, weak signal operation must be given protection from being overrun by high powered stations of all modes. Overall, interference mitigation techniques must be outlined specifically in a new proposal.

AUTOMATICALLY CONTROLLED STATIONS

When describing the interference that automatically controlled stations generate the ARRL states that:

“While it is not ARRL's intention whatsoever to segregate HF data communications by rule, it is necessary to do so where the station or network configuration is such that stations under automatic control can initiate transmissions. To do otherwise would be to create an environment where such stations might initiate transmissions that would interfere with ongoing communications on the same frequency using incompatible emission types.”

This statement totally ignores the interference with ongoing communications that an automatically controlled station will generate when responding to an interrogation. It does not matter whether the interrogation comes from a station that is manually controlled or automatically controlled.

The ARRL has coined a new term “semi-automatic control” and attempted to define it in such a manner that its use will:

“... suffice for interference avoidance purposes generally to require, as does the current Section 97.221(c)(1), that stations under automatic control (outside the specific segments where automatically controlled stations can operate without this limitation) not initiate communications without interrogation by a station under local or remote control.”

This description of a new “semi-automatic control” operational characteristic attempts to obscure that fact that the interrogating station IS NOT in control of the responding automatic station. Consequently, the interrogating station can not insure that control operator requirements are met at the automatic station. At best, it could be called “semi-automatic operation”. This type of operation will not prevent the hidden transmitter effect. This effect was discussed at length during the recent FCC proceeding on Software Defined Radios and Frequency Reuse. One of the main conclusions was that automatically controlled stations can not prevent the hidden transmitter effect.

When the FCC developed Section 97.221(c), it was recognized that automatic stations, regardless of what triggers them, can cause interference to other amateur stations. To mitigate interference the FCC required that an automatic station operating outside the prescribed sub-bands could only use a small bandwidth and only respond to an interrogation. The origination of that interrogation was not described and rightly so. The interrogating station, whether automatically or manually controlled, has no means to insure that the responding automatic station is not creating interference to other Amateur stations already using the frequency.

The ARRL goes on to indicate that:

“Residual risk of interference from this station (or network) configuration can best be managed by the Amateur community through a combination of technology (including further development of listen-before-transmit protocols) ...“

The FCC has already determined in its Software Defined Radio proceeding that busy detection circuitry (listen-before-transmit) will not suffice to eliminate interference problems. The propagation on the HF bands at 40 meters and above almost always insures that the busy detection circuitry can NOT hear both sides of an existing Amateur conversation. If the busy detector can not hear the side of the conversation that is currently transmitting, it will begin transmitting and interfere with the receiving station already in conversation. Likewise, the interrogated automatically controlled station will begin responding when its busy detector determines that the frequency is clear because the station it cannot hear has begun transmitting. The only method to insure little interference is generated is for both stations to communicate, using an “off channel” connection, that the frequency is busy so that neither station transmits if either detect a busy frequency. The “off channel” connection could use a small bandwidth signal in the designated automatically controlled station bands to do this communications.

It would be a task beyond my undertaking to list all the changes to the ARRL proposal to replace the deletions and additions concerning automatically controlled stations. Consequently, I recommend that the proposal be rejected and the ARRL directed to not make any changes to regulations concerning the operation of automatically controlled stations in a subsequent petition except for an addition that allows wider bandwidths to be used outside the currently prescribed bands if and only if a “off-channel busy communications protocol” is used when interrogating an automatically controlled station.

OTHER PROBLEMS

There are numerous other problems contained in the proposal and I will mention them briefly.

The proposed 200 Hz segment on 40 meters only allows a 10 kHz segment for all General class licensees to operate in. This is unrealistic as the General Class is the largest of all licensees with HF privileges.

The deletion of 97.307(f)(4) through (13) removes all current restrictions on all HF Novice and Technician Class operations. This change was not discussed in the ARRL proposal. Was this inadvertent or intended? Since 97.301(e) was not changed, one must assume that the ARRL intended to remove these restriction. This 'upgrade' of these license classes at least deserves mention and a rationale placed in the record.

Section 97.305 has been amended to allow any emissions type on the HF bands. The ARRL has not discussed how this will affect interference temperatures on these bands. There is no discussion on what operational techniques can be used to mitigate interference between disparate modes of operation.

Section 97.305 has been amended to allow 100 kHz wide signals to be used on the 2 meter band throughout the portions allotted to Amateur repeaters. This is a prescription for interference to repeaters and for reducing the usefulness of repeaters in emergency communications.

Section 97.109(e) has been amended to disallow all retransmitted messages that are not originated at a station that is under local or remote control, i.e. originated at an automatically controlled station. This will effectively silence the currently operating packet networks, the ARRL's own NTS Digital network, and most if not all networks using WIFI/WIMAX transceivers on the Amateur bands. An example would be wireless equipped laptop using a device properly operating on an Amateur band communicating via a wireless router to another point. This would require a control operator, either locally or remotely, to manually control the wireless device in the laptop or the router would be barred from retransmitting the message.

The ARRL proposal only mentions in passing, IARU Regional band plans. There is no discussion and no analysis of how the recommendations in this proposal will mesh with HF Amateur operations worldwide. It is likely that US Amateurs will be placed in the position of attempting weak signal, narrow band digital communications where Amateurs in other countries are only allowed wide band and high power communications. This at least deserves a critical analysis and discussions of options.

SUMMARY

The ARRL has proposed a sweeping and massive change to the FCC regulations that govern Amateur Radio. The ARRL has the responsibility to carefully analyze and provide substantial background information concerning these massive changes. While some of the issues raised in the petition are valid, there is no analysis of why simple changes to current regulations could have been done rather than make massive changes.

As shown above, there are many, many issues and concerns that can and should be raised about a change as massive as the one recommended. However, the ARRL petition has no scientific data or analysis on usage, interference temperature changes, and the operational characteristics of disparate modes operating together. One can not judge either the need or the adequacy of the changes by the information contained in the ARRL's petition. One is left to assume that the ARRL expected their

assertions and recommendations to be accepted on faith alone.

Based on the lack of analysis of the complicated problems introduced by this petition, I recommend that the petition be dismissed in whole. The ARRL should be directed to provide detailed information that allows one to critically analyze changes in any future petition concerning this matter.

I would like to thank the FCC for providing the opportunity to so easily place comments on this petition into the record.

James G. Gorman
WA0LYK